PRODUCT REGISTRY - APDU PAYLOAD ENCODING

The APDU Payload follows the APDU Header and comprises the remainder of the APDU. An APDU Payload contains all or segmented portions of an FIS-B Product File. This section provides the minimum specification for the FIS-B Product File, or the reference source for Proprietary or Developmental products. It is anticipated that additional FIS-B Product Files will be included in this section as new products and/or new (and improved) encoding techniques are developed.

- Section 1.0 describes Textual products,
- Section 2.0 describes Graphical products,
- Section 3.0 describes Gridded products,
- Section 4.0 describes System Information,
- Section 5.0 describes Generic Products,
- Section 6.0 describes sources for Proprietary products, and
- Section 7.0 describes sources for Developmental products.

1.0 Textual FIS Products

Textual products include free-text messages, such as SIGMETs and AIRMETs, and formatted text messages, such as TAFs, METARs and NOTAMs. These may be compressed singly, or in groups of the same products for greater efficiency, using textual compression methods in Section D.2.2.3 in RTCA DO-267A.

1.1 Textual Product Characteristics

This section defines formatting characteristics for textual FIS products. See Section 3.8.1 in DO-267A for additional background on formatting textual products.

1.1.1 Format of FIS Textual Messages

Textual FIS product messages consist of sequences of characters taken from one of the FIS character sets defined in Section 3.8.1.6 of RTCA DO-267A. A single FIS textual product shall consist of one or more logical text lines separated using the FIS end-of-line character from the selected FIS character set.

1.1.2 Multiple Textual Products Grouped into Single Message

Multiple instances of a given FIS textual product may be grouped into a compound message that may consist of two or more APDUs. (For example, the textual METARs for a region may be transmitted as a single FIS message.) The FIS record-separator character from the selected character set shall be used to separate the FIS textual product instances within a compound FIS message. There is no need to use an FIS end-of-line character prior to an FIS record-separator character; the line break at the end of the product instance is assumed. The last FIS product instance in a compound FIS textual product is terminated with the FIS end-of-text character instead of a record-separator character.

1.1.3 Textual Message Compression

In the interests of reducing message bandwidth, lossless compression algorithms may be applied to the FIS textual product text strings prior to their insertion into APDUs. The default algorithm, DEFLATE, is described in Section D.2.2.3 in RTCA DO-267A.

1.2 METAR and SPECI (text)

Assigned Product ID #s as follows:

0 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

20 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

METARs and SPECIs are meteorological observations or reports and shall be formatted in accordance with the FAA Order 7900.5B. Additionally, such messages may be displayed in plain text or other decoded fashion.

1.3 TAF and AMENDED TAF (text)

Assigned Product ID #s as follows:

1 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

21 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

TAFs are meteorological forecasts and shall be formatted in accordance with the FAA Order 7900.5B. If the TAF is abbreviated, there is still a requirement to show the issuance time and the valid period being displayed. Additionally, such messages may be displayed in plain text or other decoded fashion.

1.4 SIGMETs

Assigned Product ID #s as follows:

2 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

22 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

Textual SIGMETs are weather advisories concerning weather significant to the safety of all aircraft. They contain free text and cover severe and extreme turbulence, severe icing, widespread dust or sandstorms, and volcanic ash.

1.5 Convective SIGMETs

Assigned Product ID #s as follows:

3 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

23 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

Convective SIGMETs are weather advisories concerning convective weather significant to the safety of all aircraft. They contain free text and are issued for tornadoes, lines of thunderstorms, embedded thunderstorms and areas of thunderstorms.

1.6 AIRMETs

Assigned Product ID #s as follows:

4 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

24 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

AIRMETs are in-flight weather advisories concerning weather of less severity than that covered by SIGMETs and Convective SIGMETs. They contain free text and cover moderate icing, moderate turbulence, sustained winds of 30 knots or more at the surface, widespread areas of ceilings less than 1,000 ft and/or visibility less than 3 miles, and extensive mountain obscurement.

1.7 PIREPs

Assigned Product ID #s as follows:

5 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

25 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

PIREPs contain free text. They are reports of meteorological phenomena encountered by aircraft in flight.

1.8 Severe Weather Forecast Alert (AWW)

Assigned Product ID #s as follows:

6 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

26 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

AWWs contain free text. They are unscheduled messages and define areas of possible severe thunderstorms or tornado activity.

1.9 Non-Gridded Forecasts of Winds and Temperatures Aloft

Assigned Product ID #s as follows:

7 - when encoded using ASCII character set (WMO Telegraph Alphabet Number 5)

27 - when encoded using Data Link Application Coding (DLAC) 6-bit character set; see Appendix K, RTCA DO-267A

Winds and Temperatures Aloft is a combined, non-gridded textual forecast product as described in FAA Advisory Circular AC-0045E, "Aviation Weather Services," and shown in the following example in Figure 1.9-1. This product contains text arranged in a table layout, with airport and other location identifiers down the left-hand column and altitudes across the top. The height of the table is variable, based on how much room is available for display. The width of the table is normally to 39,000 feet but data for 45,000 and 53,000 are available from the same data source. Data entries (table cells) contain wind direction in tens of degrees (e.g., 36 for 360) and wind speed in knots. Above 3,000 feet, temperature is attached without a space and preceded with a + or - in degrees Celsius. Times are given in UTC, including the time upon which the forecast is based, the valid time of the forecast and "for use" times. A statement appears "negative temperatures above (altitude)" to eliminate the need for a + or - at higher altitudes.

FD KWBC 151640
BASED ON 151200Z DATA
VALID 151800Z FOR USE 1700-2100Z TEMPS NEGATIVE ABV 24000 FT

	3000	6000	9000	12000	18000	24000	30000	34000
ACY	3012	3112+13	3116+08	3221+03	3325-09	3533-21	366334	367444
BOS	3215	2908+12	2709+07	2711+01	3113-11	3315-22	352739	353246
EMI	3314	3417+13	3322+09	3430+05	3346-07	3446-18	366332	18243
RIC	3114	3221+14	3328+10	3333+06	3348-06	3452-17	366632	18043

Figure 1.9-1 Forecast Winds and Temperatures Aloft Message Example

1.10 Aerodrome and Airspace FIS-B Product Definitions

Please refer to the following link
http://fpr.tc.faa.gov/1_10.asp

2.0 Graphical FIS Products

This section deals with a variety of FIS products, collectively referred to as graphical. The presentation method may include the display of symbols, contours or outlines, or images representing activity such as precipitation.

2.1 NEXRAD Precipitation Graphic Products -Background

NEXRAD precipitation graphic products are transmitted in image format without a base map. Optionally they may be compressed using an appropriate scheme identified in Section D.2.2 in RTCA DO-267A. They contain data and annotation pixels. Three types of image encoding schemes, as defined below, are used to represent radar intensities and annotations. Encoding schemes for NEXRAD Precipitation Image Products are described in the following paragraphs. The NEXRAD precipitation graphics are geographically referenced using a method described in Section D.2.3 in RTCA DO-267A. There are two types of annotations that may be included in a graphic: site status indicators (for National and Regional products) and missing severe weather boxes. These annotations have meaning only for mosaic products, not individual NEXRAD site products.

2.1.1 Site status indicators (optional)

In addition to radar data, NEXRAD images may contain information about the status of each radar site. There are currently two status indicators that are used: 'present' and 'absent.' A site that is 'present' may be denoted in the image by a single pixel near the site's location with a special code. A site that is 'absent' may be denoted in the image by a single pixel near the site's location with a different code. It will be up to the end user's software to place a warning marker or 'ok' symbol to indicate the status of the radar site.

2.1.2 Missing severe weather box (optional)

An indicator of an area of missing severe weather may be included in the image. This area is known as a 'warning box.' It suggests that there are echoes of significant intensity missing from the image. The location of the missing echoes may be indicated with a 2-color box. The border of the box (codes 8-15) will be transmitted as 1 pixel in width, although it may be displayed with different thickness. The interior of the box (code 32) replaces all other NEXRAD pixel data.

2.2 Type 0 NEXRAD Precipitation Image Graphic encoding Scheme (4-level)

Assigned Product ID #s as follows:

51 for National Mosaic

55 for Regional Mosaic

59 for Individual NEXRAD Site

In this scheme, data values are represented by the codes in Table 2.2-1.

Table 2.2-1 Type 0 NEXRAD Encoding

Code	Represents		Hex
0	radar data level 0	dBZ <20, No data	0x00
1	radar data level 1	20 ≤ dBZ < 30	0x01
2	radar data level 2	30 ≤ dBZ < 40	0x02
3	radar data level 3	40 ≤ dBZ	0x03

Note: No codes are used to indicate missing data from a NEXRAD site. In this scheme, a header containing codes indicating locations for missing stations precedes the file.

2.3 Type 1 NEXRAD Precipitation Image Graphic Encoding Scheme (8-level)

Assigned Product ID #s as follows:

52 for National Mosaic

56 for Regional Mosaic

60 for Individual NEXRAD Site

In this scheme, data values are represented by the codes in Table 2.3-1. Note that these codes are compatible with legacy systems using the NWS video integrated processor (VIP) levels (air traffic control weather radar levels). They deviate slightly from A/C 25-11 or A/C 23.13-11, which define level 1 as 20 dBZ and each subsequent level in 10-dB increments. Deviations from these standards are more conservative than the above-referenced standards (with exception of a 1 dB-variation in level 3), so they should be acceptable.

Note: For color encoding, see Table 3-2, Section 3.8.2 in RTCA DO-267A.267A267A

Table 2.3-1 Type 1 NEXRAD Encoding

Code	Represents		Hex	Optional or Not
0	radar data level 0	dBZ < 5, No data	0x00	
1	radar data level 1	5 ≤ dBZ < 18	0x01	
2	radar data level 2	18 ≤ dBZ < 30	0x02	
3	radar data level 3	30 ≤ dBZ < 41	0x03	
4	radar data level 4	41 ≤ dBZ < 46	0x04	
5	radar data level 5	46 ≤ dBZ < 50	0x05	
6	radar data level 6	50 ≤ dBZ < 57	0x06	
7	radar data level 7	57 ≤ dBZ	0x07	
8	warning box border over level 0		0x08	Optional
9	warning box border over level 1		0x09	Optional
10	warning box border over level 2		0x0A	Optional
11	warning box border over level 3		0x0B	Optional
12	warning box border over level 4		0x0C	Optional
13	warning box border over level 5		0x0D	Optional
14	warning box border over level 6		0x0E	Optional
15	warning box border over level 7		0x0F	Optional
16	present site indicator over level 0		0x10	Optional
17	present site indicator over level 1		0x11	Optional
18	present site indicator over level 2		0x12	Optional
19	present site indicator over level 3		0x13	Optional
20	present site indicator over level 4		0x14	Optional
21	present site indicator over level 5		0x15	Optional
22	present site indicator over level 6		0x16	Optional
23	present site indicator over level 7		0x17	Optional
24	absent site indicator over level 0		0x18	
25	absent site indicator over level 1		0x19	
26	absent site indicator over level 2		0x1A	
27	absent site indicator over level 3		0x1B	
28	absent site indicator over level 4		0x1C	
29	absent site indicator over level 5		0x1D	

Code	Represents	Hex	Optional or Not
30	absent site indicator over level 6	0x1E	
31	absent site indicator over level 7	0x1F	
32	warning box inside over level 0	0x20	Optional

2..4 Type 2 NEXRAD Precipitation Image Graphic Encoding Scheme (8-level)

Assigned Product ID #s as follows:

53 for National Mosaic

57 for Regional Mosaic

61 for Individual NEXRAD Site

In this scheme, data values are represented by the codes in Table 2.4-1. This type 8-level NEXRAD product is an abbreviated version of the standard 16-level product described in the next paragraph.

Note: For color encoding, see Table 3-2, Section 3.8.2 in RTCA DO-267A.

Table 2.4-1 Type 2 NEXRAD Encoding

Code	Represents		Hex	Optional or Not
0	radar data level 0	dBZ < 20, No data	0x00	
1	radar data level 1	20 ≤ dBZ < 25	0x01	
2	radar data level 2	25 ≤ dBZ < 30	0x02	
3	radar data level 3	30 ≤ dBZ < 35	0x03	
4	radar data level 4	35 ≤ dBZ < 40	0x04	
5	radar data level 5	40 ≤ dBZ < 50	0x05	
6	radar data level 6	50 ≤ dBZ < 60	0x06	
7	radar data level 7	60 ≤ dBZ	0x07	
8	warning box border over level 0		0x08	Optional
9	warning box border over level 1		0x09	Optional
10	warning box border over level 2		0x0A	Optional
11	warning box border over level 3		0x0B	Optional
12	warning box border over level 4		0x0C	Optional
13	warning box border over level 5		0x0D	Optional
14	warning box border over level 6		0x0E	Optional
15	warning box border over level 7		0x0F	Optional
16	present site indicator over level 0		0x10	Optional
17	present site indicator over level 1		0x11	Optional
18	present site indicator over level 2		0x12	Optional
19	present site indicator over level 3		0x13	Optional
20	present site indicator over level 4		0x14	Optional
21	present site indicator over level 5		0x15	Optional
22	present site indicator over level 6		0x16	Optional
23	present site indicator over level 7		0x17	Optional
24	absent site indicator over level 0		0x18	
25	absent site indicator over level 1		0x19	
26	absent site indicator over level 2		0x1A	
27	absent site indicator over level 3		0x1B	
28	absent site indicator over level 4		0x1C	
29	absent site indicator over level 5		0x1D	
30	absent site indicator over level 6		0x1E	

Code	Represents	Hex	Optional or Not
31	absent site indicator over level 7	0x1F	
32	Warning box inside over level 0	0x20	Optional

2.5 Type 3 NEXRAD Precipitation Image Graphic Encoding Scheme (16-level)

Assigned Product ID #s as follows:

54 for National Mosaic

58 for Regional Mosaic

62 for Individual NEXRAD Site

This is the standard 16-level NEXRAD precipitation image. In this scheme, data values are represented by the codes in Table 2.5-1.

Note: For color encoding, see Table 3-2, Section 3.8.2 in RTCA DO-267A.

Table 2.5-1 Type 3 NEXRAD Encoding

Code	Represents		Hex	Optional or Not
0	Radar data level 0	dBZ < 5, No data	0x00	
1	Radar data level 1	5 ≤ dBZ < 10	0x01	
2	Radar data level 2	10 ≤ dBZ < 15	0x02	
3	Radar data level 3	15 ≤ dBZ < 20	0x03	
4	Radar data level 4	20 ≤ dBZ < 25	0x04	
5	Radar data level 5	25 ≤ dBZ < 30	0x05	
6	Radar data level 6	30 ≤ dBZ < 35	0x06	
7	Radar data level 7	35 ≤ dBZ < 40	0x07	
8	Radar data level 8	40 ≤ dBZ < 45	0x08	
9	Radar data level 9	45 ≤ dBZ < 50	0x09	
10	Radar data level 10	50 ≤ dBZ < 55	0x0A	
11	Radar data level 11	55 ≤ dBZ < 60	0x0B	
12	Radar data level 12	60 ≤ dBZ < 65	0x0C	
13	Radar data level 13	65 ≤ dBZ < 70	0x0D	
14	Radar data level 14	70 ≤ dBZ < 75	0x0E	
15	Radar data level 15	75 ≤ dBZ	0x0F	
16	present site indicator over level 0		0x10	Optional
17	present site indicator over level 1		0x11	Optional
18	present site indicator over level 2		0x12	Optional
19	present site indicator over level 3		0x13	Optional
20	present site indicator over level 4		0x14	Optional
21	present site indicator over level 5		0x15	Optional
22	present site indicator over level 6		0x16	Optional
23	present site indicator over level 7		0x17	Optional
24	present site indicator over level 8		0x18	Optional
25	present site indicator over level 9		0x19	Optional
26	present site indicator over level 10		0x1A	Optional
27	present site indicator over level 11		0x1B	Optional
28	present site indicator over level 12		0x1C	Optional
29	present site indicator over level 13		0x1D	Optional
30	present site indicator over level 14		0x1E	Optional

Code	Represents	Hex	Optional or Not
31	present site indicator over level 15	0x1F	Optional
32	absent site indicator over level 0	0x20	
33	absent site indicator over level 1	0x21	
34	absent site indicator over level 2	0x22	
35	absent site indicator over level 3	0x23	
36	absent site indicator over level 4	0x24	
37	absent site indicator over level 5	0x25	
38	absent site indicator over level 6	0x26	
39	absent site indicator over level 7	0x27	
40	absent site indicator over level 8	0x28	
41	absent site indicator over level 9	0x29	
42	absent site indicator over level 10	0x2A	
43	absent site indicator over level 11	0x2B	
44	absent site indicator over level 12	0x2C	
45	absent site indicator over level 13	0x2D	
46	absent site indicator over level 14	0x2E	
47	absent site indicator over level 15	0x2F	
48	warning box border over level 0	0x30	Optional
49	warning box border over level 1	0x31	Optional
50	warning box border over level 2	0x32	Optional
51	warning box border over level 3	0x33	Optional
52	warning box border over level 4	0x34	Optional
53	warning box border over level 5	0x35	Optional
54	warning box border over level 6	0x36	Optional
55	warning box border over level 7	0x37	Optional
56	warning box border over level 8	0x38	Optional
57	warning box border over level 9	0x39	Optional
58	warning box border over level 10	0x3A	Optional
59	warning box border over level 11	0x3B	Optional
60	warning box border over level 12	0x3C	Optional
61	warning box border over level 13	0x3D	Optional
62	warning box border over level 14	0x3E	Optional
63	warning box border over level 15	0x3F	Optional
64	warning box inside over level 0	0x40	Optional

2.6 Radar Echo Top Graphics - Background

Radar echo top graphics are transmitted in either bitmap or image format with optional accompanying information in numerical format. They are transmitted without a base map. Optionally, the images may be compressed using an appropriate scheme identified in Section D.2.2 in RTCA DO-267A. Echo Top bitmap products are generated using an encoding scheme defined in the following Sections 2.7 and 2.8. These products generated contain image data values that represent echo tops in thousands of feet. Storm top and velocity products may also be generated using an encoding scheme defined in following Section 2.9.

Echo top bitmap products are similar to NEXRAD precipitation graphics. They contain data values that indicate echo tops only. Echo top graphics can be regional or national. They may be geographically referenced using a method described in Section D.2.3 in RTCA DO-267A. Accompanying numerical information is geographically referenced using Latitude/longitude.

Optional accompanying numerical information may be included with image format products. Numerical information includes fields indicating the latitude and longitude of the area in which the top of storm was measured, the ground speed of the storm and its heading (relative to true north). The format of the numerical information is defined below in Section 2.9.

The following assumptions are associated with this product:

- Range of echo top may be up to 100,000 ft (outside of Continental United States [CONUS])
- Range of echo top may be up to 60,000 ft (within CONUS)
- Resolution/depiction of echo top no better than 0.6 NM, or 0.01 degree.
- Projection of echo top onto underlying map will be more efficient if latitude and longitude are reported in fractions of degrees rather than in degrees, tenths of minutes (Variance from DO-219).

2.7 Echo Top Image Graphics Scheme 1 (16-level)

Assigned Product ID # 81.

In this scheme, bitmapped data values are represented by the codes in Table 2.7-1.

Table 2.7-1 Echo Top Image Graphics Scheme 1

Code	Represents	Hex
0	no echoes	0x00
1	5 kft above mean sea level	0x01
2	10 kft above mean sea level	0x02
3	15 kft above mean sea level	0x03
4	20 kft above mean sea level	0x04
5	25 kft above mean sea level	0x05
6	30 kft above mean sea level	0x06
7	35 kft above mean sea level	0x07
8	40 kft above mean sea level	0x08
9	45 kft above mean sea level	0x09
10	50 kft above mean sea level	0x0A
11	55 kft above mean sea level	0x0B
12	60 kft above mean sea level	0x0C
13	65 kft above mean sea level	0x0D
14	70 kft above mean sea level	0x0E
15	region of missing data	0x0F

2.8 Echo Top Image Graphics Scheme 2 (8-level)

Assigned Product ID # 82.

In this scheme, bitmapped data values are represented by the codes in Table 2.8-1.

Table 2.8-1 Echo Top Image Graphics Scheme 2

Code	Represents	Hex
0	No echoes	0x00
1	5 kft above mean sea level	0x01
2	10 kft above mean sea level	0x02
3	15 kft above mean sea level	0x03
4	20 kft above mean sea level	0x04
5	25 kft above mean sea level	0x05
6	$\geq$ 30 kft above mean sea level	0x06
7	region of missing data	0x07

2.9 Storm Tops and Velocity (numerical)

Assigned Product ID # 83.

Numerical fields indicating the latitude and longitude of the area in which the top of storm was measured, the ground speed of the storm and its heading (relative to true north), may optionally be included. They have the format as shown in Table 2.9-1.

Table 2.9-1 ASN.1 Representations of Storm Tops

```
Echo_tops_data::= SEQUENCE SIZE(1..32) OF Top_data

Top_data::= SEQUENCE
{
Top5000_or_missing,
Lat_long_hundredths,
StormSpeedOPTIONAL,
DegreesTrue          OPTIONAL,
}

    top5000_or_missing ::= INTEGER(1..15)
    --Altitude in 5000's of feet
    --Units = 5000 Feet, Range (01..15)
    --value of 15 implies boundary of region of missing data

Lat_long_hundredths::= SEQUENCE
-- Latitude/Longitude in degrees/hundredths of degrees
{Latitude_hundredths,
Longitude_hundredths}
Latitude_hundredths::=INTEGER(-9000 .. 9000)
-- Latitude in degrees/hundredths of degrees

Longitude_hundredths::=INTEGER(-18000 .. +18000)
--Longitude in degrees/hundredths of degrees

    StormSpeed ::= INTEGER(0 .. 63)
    -- Ground speed of storm in knots

Degreestrue ::= INTEGER(1 .. 360)
Heading in degrees relative to true North
```

2.10 Type 4 NEXRAD Precipitation Image – Global Block Representation

Assigned Product ID # 63.

2.10.1 Definition

This description provides the format for encoding NEXRAD graphic products using the Global Block Representation format described in Section D.2.3.5 of RTCA DO-267A (FIS-B MASPS).

2.10.2 Assumptions

The receiving system can assume that when this product is received from multiple ground stations offering overlapping coverage, the areas of overlap will be assured to register and can be simply merged on the cockpit display. Each broadcasting ground station will typically broadcast product covering a 250 NM radius of the broadcasting ground station.

2.10.3 APDU Format

2.10.3.1 APDU Header

The format of the APDU header used for this product is shown in the Figure below. It follows the APDU Header Format as outlined in Appendix D of RTCA DO-267A with none of the optional fields used for this product; specifically, no Product Descriptor options and no APDU segmentation are used.

The last four zeros show the pad that is required to round out the APDU header to end on a byte boundary. The time field encoded in the APDU header is the time of product creation.

← APDU Header (48 bits) →																																
FIS-B APDU ID (16 bits)	Product Descriptor (14 bits)																Header Time (13 bits)												Pad (4 bits)			
	A f	G f	P F	Product ID (11 bits)											S f	T opt	Hours (5 bits) *(See Note 3)*					Minutes (6 bits) *(See Note 3)*										
(See Note 1)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0												0	0	0	0

Transmission order →

Notes:

1) The FIS-B APDU-ID is not transmitted in the FAA (FIS-B) network

2) While this product employs the minimal APDU header format shown above, avionics designed for operation on the FAA's network should not preclude the ability to parse ADPUs with any of the optional fields invoked. This will ensure any future products that may employ these optional fields can be processed.

3) The Hours and Minutes fields each have the MSB as the leftmost bit and the LSB as the rightmost bit.

2.10.3.2 Payload

The Global Block Representation geo references individual "bins" of the NEXRAD image to latitude and longitude rather than on a projection requiring a point of tangency. The encoded intensity levels for the individual "bins" map into "dBz" reflectivity levels as shown in the table below.

Intensity Encoding of NEXRAD Composite Reflectivity Product

Intensity Encoded Value	dBz Reflectivity Range	Weather Condition
0	dBz < 5	
1	5 ≤ dBz ≤ 20	
2	20 ≤ dBz ≤ 30	VIP 1
3	30 ≤ dBz ≤ 40	VIP 2
4	40 ≤ dBz ≤ 45	VIP 3
5	45 ≤ dBz ≤ 50	VIP 4
6	50 ≤ dBz ≤ 55	VIP 5
7	55 ≤dBz	VIP 6

Notes:

1) *The color rendering on cockpit displays of the Intensity Encoded Values 2(two) through 7 (seven) should follow the Color Philosophy for the associated Weather Condition as described in Section 3.8.2 (Table 3-2) of RTCA DO-267A (FIS-B MASPS).*
2) *The Intensity Encoded Values 0 (zero) and 1 (one) are considered Background and should be color rendered accordingly.*

2.11 Lightning Strike Graphics - Background

Lightning strike graphics are transmitted in image format without a base map. Optionally they may be compressed using an appropriate scheme identified in Section D.2.2 in RTCA DO-267A. Three image-encoding schemes are used to represent lightning strikes, as described in the following paragraphs. These lightning strike image graphics are geographically referenced using a method described in Section D.2.3 in RTCA DO-267A. Location of lightning strikes may also be transmitted as latitude, longitude pairs as defined below under "Point Phenomena." Lightning is from the National Lightning Detection Network™ (NLDN), which only reports cloud-ground strokes; it does not include inner cloud and cloud-to-cloud lightning. A caveat must be displayed with NLDN data to differentiate this product from those that contain other lightning strokes, such as from on-board storm detection equipment.

2.12 Type 1 Lightning Strike Image Encoding Scheme (pixel level)

Assigned Product ID # 101.

In this scheme lightning strike locations are marked at appropriate pixels within the image. Pixel values represent the age of the lightning strike. It is the avionics display system's responsibility to represent the lightning strike location and indicate lightning strike age. In this scheme lightning strike locations are marked

The following assumptions apply to this encoding scheme:

- It is unlikely that 2 or more strikes have occurred within the same pixel within the time window mentioned.
- Network latency decreases the value of reporting lightning more recently than 5 minutes.
- File might be a high spatial resolution (regional) data set.
- No intensity information is encoded (The display processing may integrate spatially or temporally to indicate intensity).
- Lightning proximity to flight plan can be solved graphically and therefore the latitude and longitude of each strike does not need to be transmitted.
- Time indicated is referenced to product generation. Display to pilot may include data link latency.
- Ground service provider may make a determination of missing data based on low confidence values within a region.

Table 2.12-1 Type 1 Lightning Strike Image

Code	Represents	Hex
0	No lightning strike	0x00
1	lightning strike within the last 5 minutes	0x01
2	lightning strike within the last 15 minutes	0x02
3	missing or low-confidence data within this region	0x03

2.13 Type 2 Lightning Strike Image Encoding Scheme (grid element level)

Assigned Product ID # 102.

In this scheme, lightning strike regions are marked at appropriate grid elements within the data set. Grid element values represent the age of the lightning strike and/or the number of lightning strikes within a time interval. It is the user's responsibility to represent the lightning strike location and indicate lightning strike age and frequency.

The following assumptions apply to this encoding scheme:

- File might contain a low-resolution regional or national dataset.
- Two (2) or more strikes have occurred within the same pixel domain in the time window specified. Intensity information is encoded.

- Network latency decreases the value of reporting lightning more often than within a 5-minute window.
- Time is referenced to product generation. On-board display may indicate additional data link latency.

Table 2.13-1 Type 2 Lightning Strike Image

Code	Represents	Hex
0	No lightning strike	0x00
1	Lightning strike within the last 5 minutes	0x01
2	2 ≤ # strikes <5 within the last 5 minutes	0x02
3	1 ≤ # strikes <5 from 5 to 15 minutes ago	0x03
4	1 ≤ # strikes from 15 to 30 minutes ago	0x04
5	5 ≤ # strikes within the last 5 minutes	0x05
6	5 ≤ # strikes 5 to 15 minutes ago	0x06
7	missing or low-confidence data for this region	0x07

2.14 Point Phenomena

Assigned Product ID # 151.

The point phenomena message may be used to express the distribution of weather phenomena such as lightning strikes that are highly localized in space and time. These messages describe a collection of such localized events integrated over a specified time period. The following assumptions are associated with this product:

- There can be up to 32 objects in a message, with up to 32 points in each object.
- Integration times can range up to one hour.
- Sequence numbers range up to 16.

Table 2.14-1 Point Phenomena

```
VectorPointObject SEQUENCE SIZE (1..32) OF VectorPoint

VectorPoint ::= SEQUENCE
{
sequenceNumber INTEGER (0..15),
ObjectType,
integrationTime INTEGER (1..60),  -- time in minutes
 SEQUENCE SIZE (1..32) OF PointObject
}

ObjectType ::= ENUMERATED
{
lightning (0),
reserved (3)     -- reserve space for up to 3 more types
}

PointObject ::= SEQUENCE
{
--note: angles expressed in hundredths of a degree
--pointLatitude and pointLongitude are defined like
--Latitude_hundredths and Longitude_hundredths
pointLatitude INTEGER (-9000..9000),
pointLongitude INTEGER (-18000..18000)
}
```

2.15 Surface Conditions/Winter Precipitation Graphic

Assigned Product ID # 201.

Surface conditions/winter precipitation graphics are transmitted in image format without a base map. Optionally they may be compressed using any appropriate scheme identified in Section D.2.2 in RTCA DO-267A. They contain data and annotation pixels. The data values consist of precipitation echo intensities with flags to indicate whether the precipitation is liquid, frozen, or in the crossover region between liquid and frozen. Surface conditions/winter precipitation graphics are regional and national. There are two types of annotations that may be included in a graphic: site status indicators, and missing severe weather boxes.

2.15.1 Site status indicators (optional)

In addition to precipitation intensities, Surface conditions/winter precipitation images may contain information about the status of each radar site. There are currently two status indicators that are used: 'present' and 'absent.' A site that is 'present' may be denoted in the image with a single pixel near the site's location with code 17. A site that is 'absent' may be denoted in the image with a single pixel near the site's location with code 16. It will be up to the end user's software to place a warning marker or 'ok' symbol to indicate the status of the radar site.

2.15.2 Missing severe weather box (optional)

An indicator of an area of missing severe weather may be included in the image. This area is known as a 'warning box.' It suggests that there are echoes of significant intensity missing from the image. The location of the missing echoes may be indicated with a color box. The border of the box (code 18) will be transmitted as 1 pixel in width, although it may be displayed with different thickness. The interior or the box (code 19) replaces all other pixel data.

Note: For color encoding, see Table 3-2, Section 3.8.2 in RTCA DO-267A.

Table 2.15-1 Winter Precipitation Table

Code	Represents		Hex
0	Radar data level 0	dBZ<20	0x00
1	Radar data level 1	20≤ dBZ < 30	0x01
2	Radar data level 2	30 ≤ dBZ < 40	0x02
3	Radar data level 3	40 ≤ dBZ	0x03
4	Mixed or unknown precip level 1	5 ≤ dBZ	0x04
5	Frozen precip level 1	5 ≤ dBZ	0x05
6	Missing – no data available		0x06
7	Reserved		0x07

There are several assumptions or conditions regarding this weather product:

- "Mixed" actually indicates a degree of uncertainty as to whether the precipitation in that area is frozen or not.
  - It is difficult to assign hazard levels to the mixed and frozen precipitation areas, since the nature of the precipitation in these areas is uncertain.
  - Mixed and frozen precipitation areas should be indicators to the pilot that he should seek more information (perhaps by calling a Flight Service Station).
- Present/absent site indicators are moved to the upper nibble of the byte to make them easy to remove. Rather than duplicate the present/absent site indicators, the user avionics may have to interpolate to fill in the pixel that is the site indicator.
- Because there is so much uncertainty in the interpretation of the mixed and frozen precipitation areas, they are assigned fewer bits than the liquid precipitation.

2.16 Surface Weather Systems

Assigned Product ID # 202.

This product can describe fronts, troughs, ridges, etc. Fronts and other line objects are described by sequences of vertices representing line segments. The direction of movement of the front can be deduced by the location of the PointObject, which is behind the direction of movement of the front. In other words, the barbs indicating direction of spread of the front should face away from the side of the line nearest the PointObject. This product assumes a maximum of 16 line objects in a message and up to 32 points in a line.

Table 2.16-1 Surface Weather Systems

```
SurfaceObservation ::= SEQUENCE
{
ExpirationTime,
SEQUENCE SIZE (1..16) OF LineObject
}

ExpirationTime ::= SEQUENCE
{
dayOfMonth INTEGER (1..31),
hourOfDay INTEGER (1..24)
}

LineObject ::= SEQUENCE
{
sequenceNumber INTEGER (0..15),
ObjectType,
-- note: angles expressed in hundredths of degrees
sourceLatitude INTEGER (-9000..9000),
sourceLongitude INTEGER (-18000..18000),
 SEQUENCE SIZE (1..32) OF PointObject
}

ObjectType ::= ENUMERATED
{
coldFront (0),
warmFront (1),
stationaryFront (2),
occludedFront (3),
trough (4),
ridge (5),
squallline (6),
reserved (7)   -- allow for two more types
}

PointObject ::= SEQUENCE
{
--note: angles expressed in hundredths of a degree
--PointObject indicates origin of front, i.e., barbs on front depiction should point
-- away from PointObject
pointLatitude INTEGER (-9000..9000), --like Latitude_hundredths
pointLongitude INTEGER (-18000..18000) –like Longitude_hundredths
}
```

2.17 Graphical AIRMETs, SIGMETs

Assigned Product ID # 254.

Graphical AIRMET products consist of the following three subtypes: Icing AIRMET graphics, Turbulence AIRMET graphics, and IFR AIRMET graphics. Graphical SIGMET products consist of SIGMET graphics and Convective SIGMET graphics. Graphical AIRMET and SIGMET products are transmitted in two formats: bitmaps without a base map; and vector format. The bitmap and vector encoding schemes are described in the following sections. Bitmap graphics are geographically referenced using a method described in Section D.2.3 in RTCA DO-267A. AIRMET and SIGMET vector graphics have internal latitude longitude pairs.

Graphical AIRMET and SIGMET files may be one of three forms:

- Individual graphical AIRMETs or SIGMETs in/near the service volume
- Collected graphical AIRMETs/SIGMETS in/near the service volume
- National map of graphical AIRMETs/SIGMETs

2.17.1 Graphical AIRMET, SIGMET Bitmap Encoding Scheme

In this scheme, hazard watch boxes are represented by polygons in the bitmap. The polygons may be filled or unfilled. A bitmap product may contain one or more polygons. Each polygon has a label associated with it containing an indication of the hazard type, severity, and/or a watch box ID (polygon ID). Polygons representing the same hazard within a bitmap are encoded with the same code values (e.g., several areas of icing); they are indistinguishable in the bitmap. Polygons representing different hazards within a bitmap are encoded with different code values (e.g., IFR and Mountain Obscuration). Up to three different types of hazards can be encoded in a single bitmap product. Each product includes a legend stating the valid outlook period for the product. In addition to the bitmap data, the bitmap products contain two fields: one indicating the product type (e.g., Icing AIRMET or Convective SIGMET) and one indicating the product generation time. The bitmap-encoding scheme is described in Table 2.17-1.

Table 2.17-1 Graphical AIRMETs, SIGMETs Bitmap Encoding Scheme

Code	Represents	Hex
0	Outside the hazard polygon	0x00
1	Product legend	0x01
2	Polygon 1 Outline: Label (Hazard type, altitude, etc.) Optional filled area	0x02
3	Polygon 2 (used as required) Outline: Label (Hazard type, altitude, etc.) Optional filled area	0x03
4	Polygon 3 (used as required) Outline: Label (Hazard type, altitude, etc.) Optional filled area	0x04

Note: Polygon 1 codes are repeated as necessary to define multiple watch boxes representing the same hazard. Polygon 2 codes are used as necessary to define one or more watch boxes representing a different hazard than Polygon 1. Polygon 3 codes are used as necessary to define one or more watch boxes representing a different hazard than Polygon 1 and 2.

2.18 Type 4 CONUS NEXRAD Precipitation Image – Global Block Representation

Assigned Product ID # 64.

2.18.1 Definition

This description provides the format for encoding a conterminous (CONUS) NEXRAD graphic product using the Global Block Representation format described in Section D.2.3.5 of RTCA DO-267A (FIS-B MASPS). The description further defines the 2 spare bits in the first byte of the Block Reference Indicator to enable multiple image resolutions. This two-bit field will be referred to as the Bin Scale Factor.

2.18.2 Assumptions

The receiving system can assume that when this product is received from multiple ground stations offering overlapping coverage, the areas of overlap will be assured to register and can be simply merged on the cockpit display. Each broadcasting ground station will typically broadcast product covering subset/region of the total image. Depending on the value of the Bin Scale Factor, the resolution of the product image will be different and need to be accommodated by the receiving application. .

2.18.3 APDU Format

2.18.3.1 APDU Header

The format of the APDU header used for this product is shown in the Figure below. It follows the APDU Header Format as outlined in Appendix D of RTCA DO-267A with none of the optional fields used for this product; specifically, no Product Descriptor options and no APDU segmentation are used.

The last four zeros show the pad that is required to round out the APDU header to end on a byte boundary. The time field encoded in the APDU header is the time of product creation.

← APDU Header (48 bits) →																															
FIS-B APDU ID (16 bits)	Product Descriptor (14 bits)																Header Time (13 bits)												Pad (4 bits)			
	A f	G f	P F	Product ID (11 bits)												S f	T opt	Hours (5 bits) *(See Note 3)*					Minutes (6 bits) *(See Note 3)*									
(See Note 1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0												0	0	0	0

Transmission order →

Notes:

1) The FIS-B APDU-ID is not transmitted in the FAA (FIS-B) network

2) While this product employs the minimal APDU header format shown above, avionics designed for operation on the FAA's network should not preclude the ability to parse ADPUs with any of the optional fields invoked. This will ensure any future products that may employ these optional fields can be processed.

3) The Hours and Minutes fields each have the MSB as the leftmost bit and the LSB as the rightmost bit.

2.18.3.2 Payload

The Global Block Representation can represent image data at multiple resolutions. This is useful for NEXRAD images in particular because it allows larger scale images to be encoded with lower resolutions and regional images to have higher resolutions. This approach is both consistent with the intended use of the information by the pilot and the cockpit display presentation constraints that exist (i.e., viewing larger geographic areas reduce the ratio of display pixels per unit area). The following Block Reference Indicator format supersedes the Figure D-3 in RTCA DO-267A.

Bin Scale Factor: This indicates the relative scale factor for the image represented by the encoding. The possible values of this field are:

Bit Number 5	Bit Number 4	Usage Label	Meaning
0	0	High Resolution	Base encoding; each bin 1 min (lat), 1.5 min (lon) 0-60 deg latitude or 3 min (lon) 60-90 deg latitude
0	1	Medium, Resolution	5X encoding; each bin 5 min (lat), 7.5 min (lon) 0-60 deg latitude or 15 min (lon) 60-90 deg latitude
1	0	Low Resolution	9X encoding; each bin 9 min (lat), 13.5 min (lon) 0-60 deg latitude or 27 min (lon) 60-90 deg latitude
1	1		Reserved

The Global Block Representation geo references individual "bins" of the NEXRAD image to latitude and longitude rather than on a projection requiring a point of tangency. The encoded intensity levels for the individual "bins" map into "dBZ" reflectivity levels as shown in the table below.

Intensity Encoding of NEXRAD Precipitation Image

Intensity Encoded Value	dBz Reflectivity Range	Weather Condition	ATC Terminology
0	No Data		
1	$5 \leq dBz < 20$		
2	$20 \leq dBz < 30$	VIP 1	"Light"
3	$30 \leq dBz < 40$	VIP 2	"Moderate"
4	$40 \leq dBz < 45$	VIP 3	"Heavy"
5	$45 \leq dBz < 50$	VIP 4	"Heavy"
6	$50 \leq dBz < 55$	VIP 5	"Extreme"
7	$55 \leq dBz$	VIP 6	"Extreme"

Notes:

3) *The color rendering on cockpit displays of the Intensity Encoded Values 2(two) through 7 (seven) should follow the Color Philosophy for the associated Weather Condition as described in Section 3.8.2 (Table 3-2) of RTCA DO-267A (FIS-B MASPS).*
4) *The Intensity Encoded Value 0 (zero) means no reflectivity data was received. This will enable the avionics to provide an explicit indication to the pilot where NEXRAD is unavailable.*
5) *The Intensity Encoded Value 1 (one) is considered Background and should be color rendered accordingly.*

ATC terminology in accordance with FAA Information for Operators dated 4/7/07 and revised controller terminology provided in the Aeronautical Information Manual, revised 3/15/07.

3.0 Gridded Weather Forecast Products – Reserved

Gridded weather products expected to be developed for use over FIS.

4.0 System Information Products

4.1 FISDL Network System Information Products

Assigned Product ID #s as follows:

351 for System Time

352 for Operational Status

353 for Ground Station Status

This payload encoding reference is assigned for specific products that provide system information on the operational status of the FAA-Honeywell FISDL network. The formats are proprietary. Questions may be addressed to Honeywell (Bendix-King) using the contact information below:

Gary Stuteville, FISDL Program Manager
Honeywell (Bendix-King)
913-712-5545
gary.stuteville@honeywell.com

5.0 Generic Products

5.1 Generic Raster Scan Data Product – Type 1

Assigned Product ID # 401.

5.1.1 Definition

This format is intended for any type of product that employs an array of pixels in row and column format (raster-scan) which represent the smallest granularity of the image available for render on a display. The number of rows and columns are programmable. The upper left-hand corner is row zero, column zero corresponding to the left extent location provided. The lower right-hand corner is the maximum row and column pixel value corresponding to the right extent location provided. Scanning from left to right (corresponding to west to east) and top to bottom (i.e., north to south) generates the array. The pixel data value is the "color", and may have additional interpretive meaning (for example, the VIP level or warning box color in NEXRAD images). A reference geo-location is provided for map projection purposes.

5.1.2 APDU Payload Format

5.1.2.1 Payload Header

The payload header section of each generic product need be transmitted only once in a single APDU, or once in the initial APDU of any set of linked APDUs.

5.1.2.1.1 Product Type Text Field

This field always appears as the lead element in the APDU Payload and identifies the exact product name to be used by the display to identify the product (i.e., NEXRAD 1 CR, IR SATELLITE, VIS SATELLITE etc.). The field is terminated by the textual record separator (0x1E). The field is a variable length not to exceed 64 characters including separator. Its coding should be consistent with WMO-ITU International Alphabet #5 and Packed Encoding Rules (eight bit representation with a leading zero).

5.1.2.1.2 Product Parameter Fields (See assumptions below)

Also included in the APDU Payload is the following minimum set of information. The most significant bit of all data shall be transmitted first:

Table 5.1-1 Generic Raster Scan Product Parameter Fields

Parameter Group	Parameter Name	Size (octets)	Type definition and range
Issue, Observation, or Cut-off Date/Time			
	Month_of_Year	1	INTEGER (0..12) Note (1)
	Day_of_Month	1	INTEGER (0..31) Note (1)
	Hour_of_Day	1	INTEGER (0..23)
	Minute_of_Hour	1	INTEGER (0..59)
Elapsed time before expiration			
	Hours_to_Exp	1	INTEGER (0..23)
	Minutes_to_Exp	1	INTEGER (0..59)
Valid period			
	Hours_valid	1	INTEGER (0..23) Note (2)
	Minutes_valid	1	INTEGER (0..59)
Array Size			
	Max_Row	2	INTEGER (0..4095) Note (1)
	Max_Column	2	INTEGER (0..4095) Note (1)
Geo- reference point			Reference position for projection method in use
	Latitude_reference	2	SIGNED INTEGER (-9000 .. 9000)
	Longitude_reference	2	SIGNED INTEGER (-18000 .. 18000)
Left extent (upper left corner)			Upper left corner, northern and western extent of raster scan image
	Latitude_upper_left	2	SIGNED INTEGER (-9000 .. 9000)
	Longitude_upper_left	2	SIGNED INTEGER (-18000 .. 18000)
Right Extent (lower right corner)			Lower right corner, southern and eastern extent of raster scan image
	Latitude_lower_right	2	SIGNED INTEGER (-9000 .. 9000)
	Longitude_lower_right	2	SIGNED INTEGER (-18000 .. 18000)
Pixel depth	Bits_per_pixel	1	INTEGER (0..8) This value corresponds to the number of bits per pixel. In order to maximize bit packing efficiency, only the values 1,2,4 and 8 should be used. All other values are unused and reserved.
User Defined	User_Defined_Byte	1	Binary coded byte to be defined by the system provider.

5.1.2.2 Product Data Field

Table 5.1-2 Generic Raster Scan Product Data Fields

Parameter Group	Parameter Name	Size(octets)	Type definition and range
Pixel Data (row and column sequence, left to right and down) See Note (5).	Pixel_Color	Max_Row*Max_ Column	BINARY OCTET - Pixel color depth is defined by the parameter Bits_Per_Pixel. Bits are packed within octet boundaries MSB to LSB, left to right, MSB to be transmitted first. See Notes (3), (4) and (6).

5.1.3 Assumptions

- All text data will comply with the specified text character set of this document.

- A prerequisite to coding this generic data product APDU Payload is that the portion of the surface of the Earth encompassed by this product must be projected onto a flat surface using projection and geo-reference methods specified elsewhere in this document to create a weather pixel array.
- The time included is the observation time (when the product was generated) if the product is standalone, or a cut-off time (when the last data was inserted) if a mosaic product. The elapsed time before expiration is referenced to the issue, observation or cut-off time and provides the time allocated for product display and subsequent discard. The valid period taken with the observation or cut-off time provides the period the product is considered valid by the authorized observation source.

Notes

1. *The zero value is unused and reserved.*
2. *Zero values for the valid period fields indicate there is no valid time applicable for the product, only an observation or cutoff time.*
3. *The 16 colors listed below are standard colors contained in FAA AC 25-11 "Transport Category Airplane Electronic Display Systems, AMS "Guidelines for Using Color to Depict Meteorological Information: IIPS Subcommittee for Color Guidelines", and NWS specifications for surface weather charts. These also provide a superset of those identified in Table 3-2 in RTCA DO-267A for display use. A set of eight colors can be selected to provide a more minimal palette. Discrete pixel value-level coding will be in accordance with the values specified elsewhere in the MASPS (i.e., NEXRAD 1, NEXRAD 3) with the color association to be made by the weather system provider in accordance with the recommendations in this document.*

   The set of possible colors includes: Black, White, High Intensity Red, Red, Light Red (or mauve), Green, Light Green, Blue, Yellow, Amber, Cyan, Magenta, Light Magenta, Dark Gray, Light Gray, Brown.
4. *Unavailability of weather data in any geographic area of the raster scan graphic product shall be denoted in the product data field by use of an all "ones" pattern of data on a pixel by pixel basis. For example, when eight-bit pixel color depth is employed, the resulting hex value for each pixel within a "missing data" area will be "0xFF". Likewise, for four bit depth, the value will be "0xF", and for three bit, the binary value of "111", and so on. The missing data will be used for the display presentation of the required unique pattern denoting areas of unavailable weather or lack of radar coverage. This definition is not possible for one-bit color palettes.*
5. *Actual payload product data field formatting is dependent upon the selections made in the APDU Header. For example, the payload data format might be encoded with the Weather Huffman Method, Run Length Encoding, or PNG format. Also, setting of the provider-specific flag bit may impact product data field formatting. For example, the Provider-Specific Flag Bit might dictate encryption of the payload.*
6. *For example, two bit or four color encoding would consist of the following bit ordering – Pa1 Pa0 Pb1 Pb0 Pc1 Pc0 Pd1 Pd0 where Psub represents pixels a,b,c and d; each with associated encoded color values for bits one and zero.*

5.2 Generic Textual Data Product – Type 1

Assigned Product ID # 402.

5.2.1 Definition

This description provides the format for a general-purpose textual data product structure capable of supporting any textual weather product or free text in FIS-B applications.

5.2.2 APDU Payload Format

5.2.2.1 Payload Header

The payload header section of each generic product need be transmitted only once in a single APDU, or once in the initial APDU of any set of linked APDUs.

5.2.2.1.1 Product Type Field

This field always appears as the lead element in the APDU Payload and identifies the exact product name to be used by the display to identify the product (i.e., METAR, TAF, AWW, etc.). The field is terminated by the textual record separator (0x1E). The field is a variable length not to exceed 64 characters including separator. Its coding should be consistent with WMO-ITU International Alphabet #5 and Packed Encoding Rules (eight bit representation with leading zero).

5.2.2.2 Payload

This section will contain either single or multiple textual reports of the type described by the product type field. Textual characters will conform to the requirements for text products specified elsewhere in this document. An additional user defined binary byte (one octet) is provided at the start of the payload for use by the system provider for future system applications. The textual decoder should ignore this byte.

5.2.3 Assumptions

1. All text encoding should be consistent with the WMO-ITU International Alphabet #5 character set and Packed Encoding Rules (eight bit representation).
2. Selection and use of a compression method are independent of this data product definition.

5.3 Generic Vector Data Product - Type 1

Assigned Product ID # 403.

5.3.1 Definition

Vector points are stored with their position coordinates. These points may then be connected with vectors to form straight lines or chains. Chains can be connected back to the starting point to enclose polygons. Vectors may also be shown independently to form wind barbs, for instance. An optional fill color can be used for enclosed areas. Vector format is an efficient method of image representation since only points where there is information or which form parts of boundaries are stored. A means for presenting "anchored" textual information is provided, as might be used in Graphical AIRMETs or Alert Weather Watch products with graphically depicted warning areas with associated text.

5.3.2 APDU Payload Format

5.3.2.1 Payload Header

The payload header section of each generic product need be transmitted only once in a single APDU, or once in the initial APDU of any set of linked APDUs.

5.3.2.1.1 Product Type Text Field

This field always appears as the lead element in the APDU Payload and identifies the exact product name to be used by the display to identify the product (i.e., METAR, TAF, AWW, etc.). The field is terminated by the textual record separator (0x1E). The field is a variable length not to exceed 64 characters including separator. Its coding should be consistent with WMO-ITU International Alphabet #5 and Packed Encoding Rules (eight bit representation with leading zero).

5.3.2.1.2 Product Parameter Fields

The most significant bit of all data shall be transmitted first.

Table 5.3-1 Generic Vector Data Product Parameter Fields

Parameter Group	Parameter Name	Size (octets)	Type definition and range
Issue, Observation, or Cut-off Date/Time			
	Month_of_Year	1	INTEGER (0..12) Note (1)
	Day_of_Month	1	INTEGER (0..31) Note (1)
	Hour_of_Day	1	INTEGER (0..23)
	Minute_of_Hour	1	INTEGER (0..59)
Elapsed time before expiration – Note (2)			
	Hours_to_Exp	1	INTEGER (0..23)
	Minutes_to_Exp	1	INTEGER (0..59)
Valid period - Note (4)			
	Hours_Valid	1	INTEGER (0..23)
	Minutes_Valid	1	INTEGER (0..59)
Left Extent (upper left corner)			Upper left corner, northern and western extent of vector image
	Latitude_Upper_Left	2	SIGNED INTEGER (-9000 .. 9000)
	Longitude_Upper_Left	2	SIGNED INTEGER (-18000 .. 18000)
Number of Vector Lists in Set	Vector_List_Num	1	INTEGER (0..255)
User Defined	User_Defined_Byte	1	Binary coded byte to be defined by the system provider

5.3.2.2 Product Data Field

This entire section will be repeated the number of times dictated by parameter Vector_List_Num to form a set of vector lists.

Table 5.3-2 Generic Vector Product Data Fields

Parameter Group	Parameter Name	Size (octets)	Type definition and range
Vector List			Multiple vector lists make up a vector set
Vector Descriptor	Vector_Options	1= $b_7b_6b_5b_4b_3b_2b_1b_0$	Coded byte for detailed vector options, bits b_4 to b_0 are used as defined below, bits b_5, b_6, and b_7 are unused and reserved
	Vector_type	b_0	Type of vectors to be used in the list that follows 0 = paired point – two points provided for each independent vector 1= head to tail – one point provided for each vector in a chain
	Color_mode	b_1	0 = All vectors are the same color 1 = Each vector may have a different color
	Color_Palette	b_4 b_3 b_2	INTEGER (0..8) This value corresponds to the number of bits per pixel. Only values 1,2,4 and 8 should be used corresponding to the bits per vector color, with all other values unused and reserved. The color palette and number of bits to be used is selected with this parameter. See Note (3).

Parameter Group	Parameter Name	Size (octets)	Type definition and range
Text tags			Free text message for position anchored textual data conforming to textual format requirements, terminated with record separator <1E>. Each text field is associated with a lat/lon position indicating its anchor point.
	Tag_number	2	INTEGER (0..65,535) Total number of text tags
	Free_Text	1 to 64	INTEGER (1..64) Variable number of text characters including record separator termination character
	Lat_Text	2	SIGNED INTEGER (-9000 .. 9000) Lat. anchor point for each Free_Text field
	Long_Text	2	Anchor point SIGNED INTEGER (-18000 .. 18000) Lon. anchor point for each Free_Text field
Vector points			Set of vertices for line constructs with associated lat/ lon position
	Vector_Point_Num	2	INTEGER(0..65,535) Total quantity of vector points (vertices)
	Lat_Vector_Pt	2	SIGNED INTEGER (-9000 .. 9000) Vector point latitude
	Long_Vector_Pt	2	SIGNED INTEGER (-18000 .. 18000) Vector point longitude
	Vector_Num	2	INTEGER (0..65,535) Total number of vectors to be associated with vector points by order. A value of zero (0) denotes vector points only are desired (i.e., no line segments)
	Vector_Color	1 to 65,535	BINARY OCTET - List of colors for vectors associated with vector points or vector points by list order. Reduces to 1 byte when Color_Mode = 0. Bits are packed from MSB to LSB order, left to right. See Note (5). 1 bit/ vector for 1 bit palette, 2 bits/ vector for 2 bit palette, 4 bits/vector in each nibble for 3 and 4 bit palette, and a full octet/vector for the 8 bit palette.The MSB of the nibble containing the 3 bit palette value shall be zero. See Note (3).
Fill Data			Set of specified fill colors for any previously specified polygons with associated lat/ lon, 5 bytes per fill. Default is no fill.
	Fill_Data_Num	1	INTEGER (0..255) Total number of filled areas.
	Lat_Fill	2 for each filled area	SIGNED INTEGER (-9000 .. 9000) location of fill
	Long_Fill	2 for each filled area	SIGNED INTEGER (-18000 .. 18000)location of fill
	Fill_Color	1 for each filled area	BINARY OCTET - Identical to Vector_Color parameter.

5.3.3 Assumptions

1. Line widths are at the discretion of the avionics' criteria for viewability.
2. Text "tags" exact positioning relative to the anchor point is at the discretion of the avionics.

Notes

1. *The zero value is unused and reserved.*
2. *The time before expiration provides the time allocated for product display and subsequent discard.*
3. *The 16 colors enumerated are standard colors contained in FAA AC 25-11 "Transport Category Airplane Electronic Display Systems, AMS "Guidelines for Using Color to Depict Meteorological Information: IIPS Subcommittee for Color Guidelines," and NWS specifications for surface weather charts. These also provide a superset of those identified in Table 3-2 in RTCA DO-267A for display use.*

Color palette selection –

4 bit color palette-
Black (0x00),
White (0x01),
High Intensity Red (0x02),
Red (0x03),
Light Red (0x04),
Green (0x05),
Light Green (0x06),
Blue (0x07),
Yellow (0x08),
Amber (0x09),
Cyan (0x0A),
Magenta (0x0B),
Light Magenta (0x0C),
Dark Gray (0X0D),
Light Gray (0X0E),
Brown (0x0F)

3 bit color palette –
Black (0x0)
White (0x1),
Red (0x2),
Green (0x3),
Blue (0x4),
Yellow (0x5),
Magenta (0x6),
Grey (0x7)

2 bit color palette –
Black (00)
Red (01)
Green (10)
Blue (11)

The 1 bit color palette corresponds to monochrome or single color at the discretion of the display provider.

4. *Zero values for both of the valid period fields indicate there is no valid time applicable for the product.*

5. *For example, two bit or four color encoding would consist of the following bit ordering – Pa1 Pa0 Pb1 Pb0 Pc1 Pc0 Pd1 Pd0 where Psub represents pixels a,b,c and d; each with associated encoded color values for bits one and zero.*

5.4 Generic Symbolic Product – Type 1

Assigned Product ID # 404.

5.4.1 Definition

This format allows placement of symbols by specifying the symbol type, coordinates, color and orientation. The rendered image can be compromised of one or more symbolic objects. Predefined symbol types include:

a) WMO[1] present weather element international synoptic code (elements 0 - 99),
b) WMO[1] low altitude cloud types (elements 100 - 110),
c) wind speed (elements 111 - 127),
d) cloud coverage (elements 128 - 138),
e) front types (elements 139 - 145),
f) visibility (elements 146 - 148),
g) miscellaneous (elements 149 - 189).

5.4.2 APDU Payload Format

5.4.2.1 Payload Header

The payload header section of each generic product need be transmitted only once in a single APDU, or once in the initial APDU of any set of linked APDUs.

5.4.2.1.1 Product Type Text Field

This field always appears as the lead element in the APDU Payload and identifies the exact product name to be used by the display to identify the product (i.e., SURFACE COND, 24HR PROG, etc.). The field is a variable length not to exceed 64 characters including separator. Its coding should be consistent with WMO-ITU International Alphabet #5 and Packed Encoding Rules (eight bit representation with leading zero).

5.4.2.1.2 Product Parameter Fields (See assumptions below)

Table 5.4-1 Generic Symbolic Product Parameter Fields

Parameter Group	Parameter Name	Size (octets)	Type definition and range
Elapsed time before expiration – Note (3)	Hours_to_Exp	1	INTEGER (0..23)
	Minutes_to_Exp	1	INTEGER (0..59)
Valid period	Hours_Valid	1	INTEGER (0..23) Note (4)
	Minutes_Valid	1	INTEGER (0..59)
Left Extent (upper left corner)	Latitude_Upper_Left	2	SIGNED INTEGER (-9000 .. 9000) Reference latitude (upper left corner) giving northern extent
	Longitude_Upper_Left	2	SIGNED INTEGER (-18000 .. 18000) Reference longitude (upper left corner) giving western extent
	Symbol_Set	1	INTEGER (1..255) Selection of desired symbol set – Note (1)

[1] World Meteorological Organization, 1988: Manual on Codes, Volume 1. (WMO Publ. No. 306), WMO, Geneva, Switzerland

Parameter Group	Parameter Name	Size (octets)	Type definition and range
User Defined	User_Defined_Byte	1	Binary coded byte to be defined by the system provider

5.4.2.2 Product Data Field

Table 5.4-2 Generic Symbolic Product Data Fields

Parameter Group	Parameter	Size (octets)	Type definition and range
Text tags			Free text message for position anchored textual data conforming to textual format requirements, terminated with record separator <1E>. Each text field is associated with a lat/lon position indicating its anchor point.
	Text_tag_num	2	INTEGER(0..65,535)
	Free_Text	1 to 64	Number of text characters including record separator
	Lat_Text	2	Anchor point SIGNED INTEGER (-9000 .. 9000)
	Long_Text	2	Anchor point SIGNED INTEGER (-18000 .. 18000)
Symbol List			
	Symbol_Options	1= $b_7b_6b_5b_4b_3b_2b_1b_0$	
	Location_Option	Bo	Location Type: 0 = Lat/Lon of data source site 1 = ICAO ID of data source site
	Orientation_Option	b_1	Orientation Angle Inclusion 0 = Orientation angle not included with each symbol 1 = Orientation angle is included with each symbol
	Time_Stamp_Option	b_2	A value of 1 = one time stamp for the symbol list meaning all symbols possess the same Issue, Observation or Cut-off time A value of 0 = one time stamp per each symbol in list with total of Symbol_Num time stamps
		b3,b4,b5,b6,b7	Reserved
Symbol data			Sets of symbol color mode, color, type number location by ICAO ID OR lat/lon, and optionally, orientation and time stamp in sequence as shown below.
	Symbol_Num	2	INTEGER (0..65,535) Total number of symbols in this symbol list

Parameter Group	Parameter	Size (octets)	Type definition and range
	Color_Mode	1	0 = All symbols in the list use the same color 1 = All symbols may have a different color as specified by Symbol_Color
	Symbol_Color	1 or Symbol_Num dependent upon Color_Mode	List of colors for symbols associated with symbol points by list order. Reduces to 1 byte when Color_Mode = 0. Bits are packed from MSB to LSB order, left to right. See Note (5). 1 bit/ vector for 1 bit palette, 2 bits/ vector for 2 bit palette, 4 bits/vector in each nibble for 3 and 4 bit palettes, and a full octet/vector for the 8 bit palette.The MSB of the nibble containing the 3 bit palette value shall be zero. See Note (2).
Symbol		Symbol_Num elements, each element consisting of the fields defined below	
	Symbol_Type	1	INTEGER (1..255) See Note (1) below for symbol types and associated decimal value – value is converted to binary for transmission.
Location OPTION Lat/Lon	Symbol_Latitude	2	SIGNED INTEGER (-9000 .. 9000) Degrees and hundredths of degrees OPTIONAL – ICAO site ID may be used dependent upon Symbol_Options bit values
Location OPTION Lat/Lon	Symbol_Longitude	2	SIGNED INTEGER (-18000 .. 18000) Degrees and hundredths of degrees OPTIONAL – ICAO site ID may be used dependent upon Symbol_Options bit values
Location OPTION ICAO ID	ICAO_ID	4	4 character ICAO site ID Encoding should be consistent with the WMO-ITU International Alphabet #5 character set and Packed Encoding Rules (eight bit representation). OPTIONAL – Location in lat/lon may be used alternatively dependent upon Symbol_Options bit values

Parameter Group	Parameter	Size (octets)	Type definition and range
OPTIONAL	Symbol_Orientation	1	INTEGER (0 to 255) Degrees from true north clockwise in 360/255 steps OPTIONAL – Inclusion is dependent on Symbol_Options bit values
Time Stamps			
Issue, Observation, or Cut-off Date/Time OPTIONAL	Month_of_Year	1	INTEGER (0..12) Note (6) OPTIONAL – Inclusion is dependent upon Symbol_Options bit values
	Day_of_Month	1	INTEGER (0..31) Note (6) OPTIONAL – Inclusion is dependent upon Symbol_Options bit values
	Hour_of_Day	1	INTEGER (0..23) OPTIONAL – Inclusion is dependent upon Symbol_Options bit values
	Minute_of_Hour	1	INTEGER (0..59) OPTIONAL – Inclusion is dependent upon Symbol_Options bit values

5.4.3 Assumptions

The weather symbology is presented in accordance with NOAA/ NWS/ WMO guidelines as per website http://161.55.224.1/smith/UW_obs/anth10.html.

Notes

1. *Symbol set #1, WMO symbol types and associated decimal values are as follows: Cloud development not observed (0), Clouds dissolving (1), State of sky on the whole unchanged (2), Clouds generally forming (3), Visibility reduced by smoke haze (4), Haze (5), Widespread dust in suspension in the air (6), Dust or sand raised by the wind (7), Well developed dust / sand whirls (8), Duststorm or sandstorm within sight at time of observation (9), Mist (10), Patches of fog (11), More fog (12), Lightning (13), Precipitation - not reaching ground (14), Precipitation reaching the ground not near the station (15), Precipitation reaching the ground near the station (16), Thunderstorm no precipitation (17), Squalls (18), Funnel cloud (19), Drizzle (20), Rain (21), Snow (22), Rain and snow or ice pellets (23), Freezing drizzle or freezing rain (24), Rain shower (25), Snow shower (26), Hail shower (27), Fog or ice fog (28), Thunderstorm (29), Decreasing slight / moderate duststorm or sandstorm (30), No change in slight / moderate duststorm or sandstorm (31), Increasing slight / moderate duststorm or sandstorm (32), Decreasing severe duststorm or sandstorm (33), No change in severe duststorm or sandstorm (34), Increasing severe duststorm or sandstorm (35), Slight or moderate drifting snow (36), Heavy drifting snow (37), Slight or moderate blowing snow (38), Heavy blowing snow (39), Fog at a distance (40), Fog in patches (41), Visible fog becoming thinner (42), Obscured fog becoming thinner (43), Visible fog no change (44), Obscured fog no change (45), Visible fog becoming thicker (46), Obscured fog becoming thicker (47), Visible fog or ice fog (48), Obscured fog or ice fog (49), Slight drizzle not freezing intermittent (50), Slight drizzle not freezing continuous (51), Moderate drizzle not freezing intermittent (52), Moderate drizzle not freezing continuous (53), Heavy drizzle not freezing intermittent (54), Heavy drizzle not freezing continuous (55), Slight drizzle freezing (56), Moderate or heavy drizzle freezing (57), Slight drizzle and rain (58), Moderate or heavy drizzle and rain (59), Slight rain not freezing intermittent (60), Slight rain not freezing continuous (61), Moderate rain not freezing intermittent (62), Moderate rain not freezing continuous (63), Heavy rain not freezing intermittent (64), Heavy rain not freezing continuous (65), Slight rain freezing (66), Moderate or heavy rain freezing (67), Slight rain or drizzle and snow (68), Moderate or heavy rain or drizzle and snow (69), Slight intermittent fall of snowflakes (70), Slight continuous fall of snowflakes (71), Moderate intermittent fall of snowflakes (72), Moderate continuous fall of snowflakes (73), Heavy intermittent fall of snowflakes (74), Heavy continuous fall of snowflakes (75), Diamond dust (76),*

Snow grains (77), Snow crystals (78), Ice pellets (79), Slight rain showers (80), Moderate or heavy rain showers (81), Violent rain showers (82), Slight shower of mixed rain and snow (83), Moderate or heavy shower of mixed rain and snow (84), Slight snow showers (85), Moderate or heavy snow showers (86), Slight shower of snow pellets or small hail (87), Moderate or heavy shower of snow pellets or small hail (88), Slight shower of hail (89), Moderate or heavy shower of hail (90), Proceeding thunderstorm, slight rain (91), Proceeding thunderstorm, moderate or heavy rain (92), Proceeding thunderstorm, slight snow or rain (93), Proceeding thunderstorm, moderate or heavy snow or rain (94), Slight or moderate thunderstorm with rain or snow (95), Slight or moderate thunderstorm with hail (96), Heavy thunderstorm with rain or snow (97), Thunderstorm combined with duststorm or sandstorm (98), Heavy thunderstorm with hail (99), No stratocumulus, stratus, cumulus or cumulonimbus clouds (100), Cumulus with little vertical extent (101), Cumulus of moderate or strong vertical extent (102), Cumulonimbus (103), Stratocumulus formed from the spreading out of Cumulus (104), Stratocumulus not formed from the spreading out of Cumulus (105), Stratus in a more or less continuous sheet or layer (106), Stratus fractus or cumulus fractus of bad weather (107), Cumulus and stratocumulus other than that formed from the spreading out of cumulus (108), Cumulonimbus, the upper part of which is clearly fibrous (cirriform) (109), Stratocumulus, stratus, cumulus and cumulonimbus invisible owing to darkness, fog, blowing snow, dust or sand, or other similar phenomena (110), Windspeed calm (111), Windspeed 1-2 kts (112), Windspeed 3-7 kts (113), Windspeed 8-12 kts (114), Windspeed 13-17 kts (115), Windspeed 18-22 kts (116), Windspeed 23-27 kts (117), Windspeed 28-32 kts (118), Windspeed 33-37 kts (119), Windspeed 38-42 kts (120), Windspeed 43-47 kts (121), Windspeed 48-52 kts (122), Windspeed 53-57 kts (123), Windspeed 58-62 kts (124), Windspeed 63-67 kts (125), Windspeed 68-72 kts (126), Windspeed 73-77 kts (127), Cloud coverage clear (128), Cloud coverage ≤ 1/10 (129), 2/10 ≤ Cloud coverage ≤ 3/10 (130), Cloud coverage 4/10 (131), Cloud coverage 5/10 (132), Cloud coverage 6/10 (133), 7/10 ≤ Cloud coverage ≤ 8/10 (134), Cloud coverage ≤ 9/10 (135), Cloud coverage overcast (136), Sky obscured (137), Cloud coverage missing (138), Cold front (139), Warm front (140), Stationary front (141), Occluded front (142), Trough (143), Ridge (144), Squall line (145), IFR (146), VFR (147), MVFR (148), High Pressure (149), Low Pressure (150), Plus (151), Minus (152), Point (153), A (154), B (155), C (156), D (157), E (158), F (159, G (160), H (161), I (162), J (163), K (164), L (165), M (166), N (167), O (168), P (169), Q (170), R (171), S (172), T (173), U (174), V (175), W (176), X (177), Y (178), Z (179), 0 (180), 1 (181), 2 (182), 3 (183), 4 (184), 5 (185), 6 (186), 7 (187), 8 (188), 9 (189)

Future additional symbol sets to be provided in this section.

2. *The 16 colors enumerated are standard colors contained in FAA AC 25-11 "Transport Category Airplane Electronic Display Systems, AMS "Guidelines for Using Color to Depict Meteorological Information: IIPS Subcommittee for Color Guidelines", and NWS specifications for surface weather charts. These also provide a superset of those identified in Table 3-2 in RTCA DO-267A for display use.*

   Color palette selection –

   4 bit color palette-
   - *Black (0x00),*
   - *White (0x01),*
   - *High Intensity Red (0x02),*
   - *Red (0x03),*
   - *Light Red (0x04),*
   - *Green (0x05),*
   - *Light Green (0x06),*
   - *Blue (0x07),*
   - *Yellow (0x08),*
   - *Amber (0x09),*
   - *Cyan (0x0A),*
   - *Magenta (0x0B),*
   - *Light Magenta (0x0C),*

Dark Gray (0X0D),
Light Gray (0X0E),
Brown (0x0F)

3 bit color palette –
Black (0x0)
White (0x1),
Red (0x2),
Green (0x3),
Blue (0x4),
Yellow (0x5),
Magenta (0x6),
Grey (0x7)

2 bit color palette –
Black (00)
Red (01)
Green (10)
Blue (11)

The 1 bit color palette corresponds to monochrome or single color at the discretion of the display provider.

3. *The time before expiration provides the time allocated for product display and subsequent discard.*

4. *Zero values for both of the valid period fields indicate there is no valid time applicable for the product.*

5. *For example, two bit or four color encoding would consist of the following bit ordering – Pa1 Pa0 Pb1 Pb0 Pc1 Pc0 Pd1 Pd0 where Psub represents pixels a,b,c and d; each with associated encoded color values for bits one and zero.*

6. *The zero value is unused and reserved.*

5.5 Generic Textual Data Product - Type 2

Assigned Product ID # 405.

5.5.1 Definition

This description provides the format for a general-purpose textual data product structure capable of supporting any textual weather product or free text in FIS-B applications.

5.5.2 APDU Payload Format

5.5.2.1 Payload Header

The payload header section of each generic product consisting of the Product Type Text Field and Product Parameter Fields need be transmitted only once in a single APDU, or once in the initial APDU of any set of linked APDUs.

5.5.2.1.1 Product Type Field

This field always appears as the lead element in the APDU Payload and identifies the exact product name to be used by the display to identify the product (i.e., METAR, TAF, AWW, etc.) The field is terminated by the textual record separator (0x1E). The field is a variable length not to exceed 64 characters including separator. Its coding should be consistent with WMO-ITU International Alphabet #5 and Packed Encoding Rules (eight bit representation with leading zero).

5.5.2.1.2 Product Parameter Fields

Parameter Group	Parameter	Size (Octets)	Type definition and range
User Defined	User Defined Bytes	3	Binary coded byte to be defined by the system provider.
Elapsed time before expiration – Note (1)	Hours_to_Exp	1	INTEGER (0..23)
	Minutes_to_Exp	1	INTEGER (0..59)

5.5.2.2 Product Data Field

This section will contain either single or multiple textual reports of the type described by the product type field. Textual characters will conform to the requirements for text products specified elsewhere in this document. An additional user defined binary byte (one octet) is provided at the start of the payload for use by the system provider for future system applications. The textual decoder should ignore this byte.

5.5.3 Assumptions

1. All text encoding should be consistent with the WMO-ITU International Alphabet #5 character set and Packed Encoding Rules (eight bit representation).
2. Selection and use of a compression method are independent of this data product definition.

Notes:
The time before expiration provides the time allocated for product display and subsequent discard.

5.6 Generic Textual Data Product - Type 1 (DLAC)

Assigned Product ID # 411.

This format is the same the Generic Textual Data Product APDU Payload Format Type I (Paragraph 5.2) except that the DLAC 6-bit alphabet will be used. The payload textual decoder may either ignore the user defined binary byte or use it to interpret the textual characters that follow.

5.7 Generic Symbolic Data Product - Type 1 (DLAC)

Assigned Product ID # 412.

This format is the same the Generic Symbolic Data Product APDU Payload Format Type I (Paragraph 5.4) except that the DLAC 6-bit alphabet will be used.

5.8 Generic Textual Data Product – Type 2 (DLAC)

Assigned Product ID # 413.

5.8.1 Definition

This description is based on the Generic Text Data Product-Type 2 (Section 5.5) except that the DLAC 6-bit alphabet will be used. This Generic Text Data Product is represented as strings of characters in a format that is independent of the type of text product itself. The advantage of Generic Text is that new types of text records following this format can be introduced without changes to the Application Avionics software that controls the retrieval and presentation of the text.

5.8.2 APDU Format

5.8.2.1 APDU Header

The format of the APDU header used for this product is shown in the Figure below. It follows the APDU Header Format as outlined in Appendix D of RTCA DO-267A with none of the optional fields used for this product; specifically, no Product Descriptor options and no APDU segmentation are used.

The last four zeros show the pad that is required to round out the APDU header to end on a byte boundary. For this product, the time field encoded in the APDU header has no meaning. The time field within each text record should be used to indicate product age.

← APDU Header (48 bits) →																																
FIS-B APDU ID (16 bits)	Product Descriptor (14 bits)																Header Time (13 bits)												Pad (4 bits)			
	A f	G f	P f	Product ID (11 bits)											S f	T opt	Hours (5 bits) *(See Note 3)*					Minutes (6 bits) *(See Note 3)*										
(See Note 1)	0	0	0	0	0	1	1	0	0	1	1	1	0	1	0	0	0												0	0	0	0

Transmission order →

Note:

1) The FIS-B APDU-ID is not transmitted in the FAA (FIS-B) network

2) While this product employs the minimal APDU header format shown above, avionics designed for operation on the FAA's network should not preclude the ability to parse ADPUs with any of the optional fields invoked. This will ensure any future products that may employ these optional fields can be processed.

3) The Hours and Minutes fields in the APDU Header have no meaning for this product as Time is included in each individual text record.

5.8.2.2 Payload

General Requirements

1. All Text is composed of the DLAC 6 bit character set encoded per Appendix K of RTCA DO-267A (FIS-B MASPS).
2. Within each character the most significant bit is transmitted first. The most significant bit of character n+1 follows immediately after the least significant bit of character n.
3. The APDU will be composed of one or more whole, concatenated text records.
4. One text record will not span more than one APDU payload.
5. The length of a text record will have a maximum size of 418 bytes.

Note: An artificial limit smaller than 418 bytes may be imposed to eliminate ongoing remarks in the text message. The value would be chosen to meet two criteria:

1) the required information in the original report is faithfully preserved; and

2) the resulting size would allow several text messages to pack efficiently into each Ground Uplink message payload.

5.8.3 METAR / TAF Example

Text records for METAR and TAF are composed as shown in the syntax below:

Record = <Type> <sp> <LocID> <sp> <Time> [SP|AM]<sp> <Text report> <RS><fill bits>

The syntax elements and rules for text record composition are shown in table below:

Syntax Element	Description	Required/ Optional
<>	Denotes a text string	N/A
[]	Denotes an optional field	N/A
Sp	Denotes a single space character (100000_2)	Required
RS	Denotes the record separator character (011101_2)	Required
Type	One or more characters not containing the <sp> or <RS>. Limited to "METAR" and "TAF" initially	Required
LocID	One or more characters that can not contain <sp> or <RS>, required. Recommended but not limited to standard location Identifiers (i.e., ILN, SDF)	Required
Time	One or more characters that can not contain <sp> or <RS>. Typically represents UTC date/time group (i.e., 012155Z), and it is used to convey the Product Age for the report.	Required
SP or AM	SP denotes special METAR (SPECI) as a subset of METAR, or AM denotes amendments (AMEND) as a subset of TAF.	Optional
Text report	One or more characters that cannot contain <RS>. This is the actual text of the WMO report that may be displayed exactly as received without additional formatting or interpretation.	Required
Fill bits	0, 2, 4, or 6 bit positions set to ALL ZEROs as required to zero fill any unused bits in the last byte of the record.	Required for byte alignment

6.0 Sources for Proprietary Products

6.1 FISDL Products – Proprietary Encoding

Assigned Product ID # 600.

This payload encoding reference is assigned for specific products included in the FAA-Honeywell FISDL service. The formats are proprietary. Questions may be addressed to Honeywell (Bendix-King) using the contact information below:

Gary Stuteville, FISDL Program Manager
Honeywell (Bendix-King)
913-712-5545
gary.stuteville@honeywell.com

7.0 Sources for Developmental Products

7.1 FAA/FIS-B Developmental Products

Assigned Product ID #s as follows:

2000 for FAA/FIS-B Product 1

2001 for FAA/FIS-B Product 2

2002 for FAA/FIS-B Product 3

2003 for FAA/FIS-B Product 4

This payload encoding reference has been assigned to the FAA program for the development and testing of weather products for FIS-B distribution. APDU recipients should not attempt to decode these FAA/FIS-B Developmental Products without obtaining prior authorization and the latest encoding documentation from MITRE/CAASD. Questions can be addressed to MITRE/CAASD using the contact information provided below.

Dan Stapleton
MITRE/CAASD
703-883-7720
dstapl@mitre.org

7.2 WSI Developmental Products

Assigned Product ID # 2004.

This payload encoding reference has been assigned to Weather Services International (WSI) for the development and testing of weather products for FIS-B distribution. APDU recipients should not attempt to decode these WSI Developmental Products without obtaining prior authorization and the latest encoding documentation from WSI. Questions can be addressed to WSI using the contact information provided below.

Damon Hill
Product Engineering
Weather Services International
978-679-5019
dhill@wsi.com